77TH CONGRESS, 1st Session } HOUSE OF REPRESENTATIVES { DOCUMENT No. 324

COLUMBIA RIVER AT KENNEWICK, WASH.

LETTER

FROM

THE SECRETARY OF WAR

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, UNITED STATES ARMY, DATED APRIL 30, 1941, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND AN ILLUSTRATION, ON REEXAMINATION OF COLUMBIA RIVER, OREG., AND WASH., WITH A VIEW TO IMPROVEMENT AT AND NEAR KENNEWICK, WASH., IN THE INTEREST OF NAVIGATION, REQUESTED BY RESOLUTION OF THE COMMITTEE ON RIVERS AND HARBORS, HOUSE OF REPRESENTATIVES, ADOPTED NOVEMBER 27, 1939

JULY 23, 1941.—Referred to the Committee on Rivers and Harbors and ordered to be printed with an illustration

WAR DEPARTMENT,
Washington, July 19, 1941.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report dated April 30, 1941, from the Chief of Engineers, United States Army, on reexamination of Columbia River at Kennewick, Wash., requested by resolution of the Committee on Rivers and Harbors, House of Representatives, adopted November 27, 1939, together with accompanying papers and an illustration.

The Bureau of the Budget has been consulted and advises that while there would be no objection to the submission of this proposed report, it would not be in accord with the program of the President, in the absence of evidence showing that the proposed works possess important defense values, to submit during the present emergency any estimate of appropriation for the construction of the project.

Sincerely yours,

HENRY L. STIMSON, *Secretary of War.*

61036—41——1

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 30, 1941.

The CHAIRMAN, COMMITTEE ON RIVERS AND HARBORS,
House of Representatives, Washington, D. C.

MY DEAR MR. CHAIRMAN: 1. The Committee on Rivers and Harbors of the House of Representatives, by resolution adopted November 27, 1939, requested the Board of Engineers for Rivers and Harbors to review the reports on Columbia River, Oreg. and Wash., submitted in House Documents No. 103, Seventy-third Congress, first session, and 603, Sixty-fourth Congress, first session, with a view to determining if improvement at and near Kennewick, Wash., in the interest of navigation is advisable at this time. I enclose the report of the Board in response thereto.

2. After full consideration of the reports secured from the district and division engineers, the Board recommends modification of the existing project for the Columbia River and tributaries above Celilo Falls to the mouth of Snake River, Oreg. and Wash., to provide for the removal of obstructions in the channel between the Snake River and Kennewick, Wash., and for an approach 6 feet deep from the channel in Columbia River to the site of terminal development at Kennewick, generally as indicated on the accompanying map; all at an estimated first cost of $30,000, with $1,000 annually for maintenance in addition to the amount now required; subject to the conditions that local interests furnish assurances satisfactory to the Secretary of War that they will provide a suitable freight terminal open to all on equal terms, furnish free of cost to the United States all lands, easements, rights-of-way, and spoil-disposal areas necessary for the improvements and their subsequent maintenance, when and as required, and hold and save the United States free from claims for damages resulting from the improvements.

3. After due consideration of these reports, I concur in the views and recommendations of the Board.

Very truly yours,

J. L. SCHLEY,
Major General, Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

WAR DEPARTMENT,
THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 31, 1941.

Subject: Columbia River at Kennewick, Wash.
To: The Chief of Engineers, United States Army.

1. This report is in response to the following resolution adopted November 27, 1939:

Resolved by the Committee on Rivers and Harbors of the House of Representatives United States, That the Board of Engineers for Rivers and Harbors created under section 3 of the River and Harbor Act, approved June 13, 1902, be and is hereby, requested to review the reports on Columbia River, Oregon and Washington, submitted in House Documents Numbered 103, Seventy-third Congress, first session, and 603, Sixty-fourth Congress, first session, with a view to determining if improvement at and near Kennewick, Washington, in the interest of navigation is advisable at this time.

2. Kennewick is on the right bank of Columbia River 328 miles above its mouth and 4 miles above the mouth of Snake River. Improvement of Columbia River for navigation authorized by Congress provides for a ship channel 27 feet deep to the Bonneville Dam, 144 miles from the ocean, and 30 feet deep for 47 miles through the Bonneville Pool; thence depths of 8 feet in the Dalles-Celilo Canal and 7 feet above Celilo Falls to Wallula, mile 314. For the section between Wallula and the mouth of Snake River, a distance of 10 miles, the project provides only for removal of obstructions. The total cost under the existing project for the improvement above Celilo Falls has been $1,065,000, of which $75,000 was for maintenance. The estimated annual cost for maintenance is $50,000. The controlling depth is 4 feet in Homly Rapids, 6 miles below the Snake River, and will be 5 feet when work now under way is completed. Between Snake River and Kennewick the controlling depth of the natural river channel is 10 feet for a width of 150 feet. Opposite the site of a proposed terminal at Kennewick, the river has a depth of 6 feet for a width of 1,600 feet. Present river terminals nearest to Kennewick consist of private facilities for unloading petroleum products at Attalia, 10 miles downstream, and a privately owned grain loading terminal at Port Kelly, 4 miles below Attalia.

3. Kennewick has a population of 1,500, and Pasco, on the opposite bank, has 3,500. The area affected by establishment of navigation to Kennewick would be about 1,650 square miles with a population of 18,000. Farming and raising of sheep and cattle are the major occupations. The principal farm products are wheat, corn, alfalfa, wool, vegetables, and fruits. Industries are in general limited to canning and other processing of agricultural products. Kennewick is served by three railroads and a system of improved highways. No freight is now handled by water at Kennewick. Commerce on the river between Celilo Falls and Snake River amounted to over 135,000 tons in 1939, which was an increase of 100,000 tons over the commerce of 1938. Nearly 90 percent of the tonnage consisted of petroleum products. Wheat accounted for most of the remainder.

4. Local interests desire extension of the existing project to provide for improvement from the mouth of Snake River to Kennewick and dredging to suitable depth of an area between the river channel and a terminal which they propose to build on the permanent bank where swift currents and ice damages would be largely avoided. The terminal would include repair of three existing warehouses and construction of a 50,000-bushel wheat elevator and dock, storage facilities for 500,000 gallons of gasoline, and transfer equipment. It is claimed that Kennewick, being a focal point for land transportation routes, is a logical place for transfer between land and water, that a terminal there is necessary if maximum use is to be made of the channels already provided in Columbia River, and that 50,000 tons of commodities to and from the Kennewick side of the river would be handled through the terminal annually with savings in transportation costs of $65,000. A navigation company which operates on the river below Umatilla, mile 289, indicates that it intends to extend service to Kennewick if terminal facilities are made available. Local interests offer to provide spoil-disposal areas.

5. The district engineer finds that a suitable channel is available between the Snake River and Kennewick. He estimates the initial cost of the desired facilities at Kennewick at $85,000, of which $30,000

is for dredging channelward of the terminal site to a depth of 6 feet. The total annual cost is estimated at $8,100. This includes $1,000 for maintenance dredging and $1,100 for other charges relative to the dredging work. The district engineer estimates that 15,000 tons of wheat bound for Portland, 263 miles downstream, might move through the terminal annually with saving in transportation costs of $24,600. This is based on comparison of existing rail rates with probable water rates. Gasoline received at Kennewick is now shipped by barge to Attalia and trucked the intervening 17 miles. It is estimated that water transportation direct to Kennewick would permit annual savings of $6,900 in movement of 16,000 tons of this commodity. He notes that these annual savings in transportation charges of $31,500, are nearly four times the estimated annual cost of the improvement. The district and division engineers concur in recommending extension of the project to Kennewick and dredging to the terminal site, provided local interests assure the provision of adequate shore terminal facilities.

VIEWS AND RECOMMENDATIONS OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

6. The Board concurs in general with the reporting officers. A terminal at Kennewick would enlarge the area which may make profitable use of the Federally improved river channel and permit transportation savings on existing commerce, susceptible of barge movement, commensurate with the cost of the improvement. General benefits to be expected warrant dredging the approach channel at Federal expense. The Board recommends modification of the existing project for the Columbia River and tributaries above Celilo Falls to the mouth of Snake River, Oreg. and Wash., to provide for the removal of obstructions in the channel between the Snake River and Kennewick, Wash., and for an approach 6 feet deep from the channel in Columbia River to the site of terminal development at Kennewick, generally as indicated on the accompanying map; all at an estimated first cost of $30,000, with $1,000 annually for maintenance in addition to the amount now required; subject to the conditions that local interests furnish assurances satisfactory to the Secretary of War that they will provide a suitable freight terminal open to all on equal terms, furnish free of cost to the United States all lands, easements, rights-of-way and spoil disposal areas necessary for the improvements and their subsequent maintenance, when and as required, and hold and save the United States free from claims for damages resulting from the improvements.

For the Board:

THOMAS M. ROBINS,
Brigadier General, Corps of Engineers,
Senior Member.

REEXAMINATION OF COLUMBIA RIVER AT AND NEAR KENNEWICK, WASH.

SYLLABUS

The district engineer believes that sufficient savings would result from the construction of terminal facilities and a turning basin in Columbia River at Kennewick to provide economic justification for the proposed work. It appears reasonable

that the Federal Government assume the costs of the necessary channel excavation, which involves only a turning basin adjacent to the terminal at Kennewick.

He therefore recommends that the project "Columbia River and tributaries above Celilo Falls to the mouth of Snake River, Oreg. and Wash.," be modified to include (*a*) extension upstream from the mouth of Snake River to the highway bridge at Kennewick, and (*b*) provision of a turning basin at Kennewick, at an initial cost to the Federal Government of $30,000 for dredging; provided that no work be done or funds be expended on the project until assurances satisfactory to the Secretary of War have been given by local interests that adequate shore terminal facilities will be constructed to insure full use of the river channel.

WAR DEPARTMENT,
OFFICE OF THE DISTRICT ENGINEER,
Portland, Oreg., January 22, 1941.

Subject: Review of reports on Columbia River with a view to improvement at and near Kennewick, Wash., in the interest of navigation.

To: The Division Engineer, North Pacific Division, Portland, Oreg.

AUTHORITY

1. Review of the reports contained in House Documents No. 103 Seventy-third Congress, first session, and No. 603, Sixty-fourth Congress, first session, was requested by the Committee on Rivers and Harbors of the House of Representatives, United States, by resolution adopted November 27, 1939, as follows:

Resolved by the Committee on Rivers and Harbors of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors created under section 3 of the Rivers and Harbors Act, approved June 13, 1902, be and is hereby, requested to review the reports on Columbia River, Oregon and Washington, submitted in House Documents numbered 103, Seventy-third Congress, first session, and 603, Sixty-fourth Congress, first session, with a view to determining if improvement at and near Kennewick, Washington, in the interest of navigation is desirable at this time.

2. *Reports under review.*—The recommendations of the Board of Engineers for Rivers and Harbors contained in the report in House Document No. 603, Sixty-fourth Congress, first session, is as follows:

* * * The Board therefore reports, in concurrence with the views of the district officer and the division engineer, that it is not advisable for the United States to undertake the improvement of the Columbia River at Kennewick at this time.

House Document No. 103, Seventy-third Congress, first session, contains:

* * * a general plan for the improvement of the Columbia River and minor tributaries for the purposes of navigation and efficient development of water power, the control of floods, and the needs of irrigation;

but does not specifically refer to navigation problems in the vicinity of Kennewick.

3. *Scope of this report.*—This report will be confined to study of the advisability of improvement of the Columbia River in the vicinity of Kennewick, Wash., with a view to determining the present advisa-

bility of dredging to provide access to a proposed terminal to be located on the river's bank.

DESCRIPTION

4. The Columbia River rises in British Columbia, near the international boundary, enters the United States near the northeastern corner of the State of Washington, flows southerly to the Washington-Oregon boundary line, thence westerly between the two States, discharging into the Pacific ocean 583 miles north of San Francisco Bay. The river has a total length of about 1,210 miles and drains an area of about 259,000 square miles, 39,000 square miles of which lie in Canada.

5. The largest tributary is the Snake River, which rises in Yellowstone National Park in western Wyoming, and joins the Columbia near Kennewick, Wash., 324 miles above its mouth. It has a length of about 1,036 miles and a drainage area of 109,000 square miles. This stream and its tributaries drain portions of Idaho, Wyoming, Utah, Nevada, Washington, and Oregon.

6. The great fall in the river system, together with the comparatively large low-water flow, forms the basis of a large potential hydroelectric development, but presents a condition adverse to navigation at points above the limits of the pool of Bonneville Dam. The fall of the Columbia from the mouth of the Snake to Celilo Falls (123 miles) is about 186 feet, most of which occurs at numerous rapids near the upper and lower reaches of the stretch. The cities of Kennewick and Pasco, Wash., lie on opposite banks of the Columbia about 4 miles above the mouth of the Snake.

7. Reference gages for water stages and discharges in the stretch of Columbia River at Kennewick, Wash., are the United States Geological Survey gages, Columbia River at Trinidad and Yakima River at Kiona, and the Weather Bureau gage at Umatilla, Oreg. The lowest consecutive 15-day period of flow occurred in December 1936. The average gage reading at Umatilla, Oreg., during this period was about 0.0 and at Trinidad, Wash., 17.0. The plane thus determined is considered adopted low water for the stretch and corresponds to a flow of about 44,000 second-feet at Umatilla and 24,000 second-feet at Trinidad. The zero of the Umatilla gage is 247.71 feet above mean sea level, while the zero of the Trinidad gage is at elevation 500 feet. The average summer freshet discharge is about 485,000 second-feet and corresponds to a gage reading of 18.0 feet at Umatilla. This average freshet raises the stage at Kennewick about the same as at Umatilla. The maximum estimated discharge at Umatilla was 1,150,000 second-feet and at Trinidad 740,000, in 1894. Low-water conditions generally prevail from October to February or March, while summer freshets occur during May, June, and July.

8. *Connecting channels.*—The channel of Columbia River upstream from Kennewick is favorable for navigation as far as the foot of Priest Rapids, a distance of 63 miles. The controlling depth at low water over a few gravel shoals in this stretch is about 3.5 feet, with varying widths. Below Kennewick to the mouth of Snake River the

controlling dimensions are, depth 10 feet, and width 150 feet. Between the mouth of the Snake and Wallula, Oreg., the controlling dimensions will be 5 by 100 feet in Homly Rapids upon completion of work now under way, about November 1, 1941. Between Wallula and Celilo the channel is generally 7 feet deep and 150 feet wide at low water. Constrictions at four shoals in this stretch—Umatilla Rapids, Umatilla Shoal, Devils Bend, and Canoe Encampment Rapids—provide a controlling depth of 6 feet through the shoals. The depths as given above refer to the present adopted low water (flow of 44,000 second-feet at Umatilla). It is expected that the operation of Grand Coulee Dam will increase the minimum flow to approximately 65,000 second-feet, and open river depths between Kennewick and Celilo an average of about 1 foot over those corresponding to present adopted low water. At Celilo the channel passes through The Dalles-Celilo Canal and Locks to join the main ship channel extending from above The Dalles, Oreg., to the sea.

9. The existing channel of Snake River between the mouth and Lewiston, Idaho, has a controlling depth at low water of less than 1 foot. Present plans contemplate construction of a channel in this stretch with minimum depth of 3.0 feet and width of 60 feet at low water, estimated to be completed in the fiscal year 1944.

10. River traffic generally moves at all times of the year except at infrequent intervals when the river is closed by ice. Wheat, the principal downstream cargo, has its peak movement usually in August or September, but large quantities are often held in storage waiting for better market conditions. Wool is in a large part moved during the spring and summer months when the river is normally in freshet. Gasoline, oil, and other in-bound commodities move throughout the year.

TRIBUTARY AREA

11. The area considered tributary to Kennewick, from which commodities would move to that point with the provision of adequate terminal facilities, lies west of Columbia River and includes a part of Benton County and the eastern portion of Yakima County. The selection of the tributary area is based on the assumption that a combined water and truck movement of commodities leaving or entering the area, with transfer at Kennewick, would be effected at less cost than by present transportation routes. Existing topographic and transportation conditions make Kennewick the natural point of interchange between land and water for all outgoing and incoming commodities adaptable to water movement.

12. A large area to the east of the river, which includes the lands of the Columbia Basin irrigation project, would normally contribute to interchange of traffic between land and water in the vicinity of Kennewick and Pasco, but it is believed that such traffic would pass through terminals on the east bank of the river and would not make use of terminal facilities at Kennewick.

13. The gross area involved, considered tributary to Kennewick, is about 1,650 square miles, of which 136,000 acres are farmed lands. About 86,000 acres are farmed under irrigation and 50,000 acres

devoted to wheat raising under dry-farming methods. Areas by counties are—

Acres	Benton County	Yakima County	Total
Irrigated	39,000	47,000	86,000
Dry farmed	50,000	0	50,000
Total	89,000	47,000	136,000

14. The population of the area is about 18,000. The principal cities, with 1930 population, are: Kennewick (1,519), Prosser (1,569), Sunnyside (2,113), Grandview (1,085), Mabton (423), and Granger (568). There has been little change since 1930.

15. Distances of population centers and nearest river terminals from Kennewick are shown below.

	Water	All rail	Highway
Attalia	10	15	17
Port Kelly	14	20	22
The Dalles	139	142	143
Portland	236	226	234
Kiona		21	18
Prosser		37	33
Grandview		43	40
Mabton		48	45
Sunnyside		51	48
Granger		60	58

16. Principal agricultural products of the area are: wheat, corn, alfalfa, vegetables, fruits, and berries, with small areas devoted to special crops, such as grapes, asparagus, and early potatoes. Sheep and cattle raising are important activities. The principal industries in the area are fruit and vegetable canning plants, and allied processing plants, of which there are several now operating. There is a flour mill operating at Prosser. There are 15 natural gas wells supplying light and fuel to the major portion of the area, with a reported annual production of 140,000,000 cubic feet.

17. *Transportation routes.*—The tributary area is traversed from east to west by two railroads, the Northern Pacific and the Union Pacific System. A branch of the Northern Pacific Railway runs from Gibbon on the main line, through Grandview, Sunnyside, and Granger, to connect with the main line at Sunnyside Junction.

18. Highway U. S. 410, a hard-surfaced road, connects Kennewick with Pasco and highways to the east, and westerly with Prosser, Grandview, Sunnyside, and Granger, all in the tributary area. This highway extends westerly from Granger through Yakima to Puget Sound points. Numerous connecting secondary highways serve the entire tributary area.

19. *Bridges.*—There are no bridges over the Columbia River below Kennewick which will need revision in connection with this project. All bridges over the navigable waterway between Kennewick and the mouth of Columbia River and pertinent facts in connection therewith are shown in the following table:

Location	Owner	Kind	Purpose	Number of spans	Horizontal clearance	Vertical clearance
Pasco, Wash.[1]	Northern Pacific Ry. Co.	Swing	Railroad	13	98.5	
Kennewick, Wash.[2]	Oregon-Washington R. R. and Navigation Co.	do	do	8	113.25	
Celilo, Oreg.	Oregon Trunk Ry.	do	do	9	[3] 95	
Hood River, Oreg.	Oregon-Washington Bridge Co.	Vertical lift	Highway	10	250	135
Cascade Locks, Oreg.	Wauna Toll Bridge Co.	Fixed	do	3	694	135
Bonneville, Oreg.[4]	Federal Government	Swing	do	3	76	
Vancouver, Wash.	Oregon and Washington Highway Departments	Vertical lift	do	13	250	154
Do	Spokane, Portland & Seattle Ry.	Swing	Railroad	9	200	
Rainier, Oreg.	Columbia River-Longview Bridge Co.	Fixed	Highway	5	1,120	167

[1] 2,000 feet below Kennewick-Pasco Highway Bridge.
[2] Five miles below Kennewick-Pasco Highway Bridge.
[3] Horizontal clearance, Dalles-Celilo Canal, 65 feet.
[4] Across lower approach at Bonneville lock.

NOTE.—All of the above bridges were built under War Department permits.

PRIOR REPORTS

20. Prior reports on Columbia River in the vicinity of Kennewick, Wash., are contained in House Documents No. 103, Seventy-third Congress, first session, and No. 603, Sixty-fourth Congress, first session. House Document No. 103 contains a general plan for the development of Columbia River in the combined interests of navigation, power, flood control, and irrigation, but does not specifically refer to navigation problems in the vicinity of Kennewick. House Document 603 dated January 19, 1916, states that the channel depths to the public place at the lower end of the city were adequate for the needs of river commerce for several years.

EXISTING PROJECT

21. The existing project for the improvement of Columbia River has as its upper limit the mouth of Snake River, about 4 miles downstream from Kennewick. There is no existing project for the improvement of the river in the vicinity of Kennewick.

TERMINAL FACILITIES

22. There are no river terminals or transfer facilities presently located at Kennewick. There are privately owned storage tanks and facilities for unloading petroleum products at Attalia, on the left bank of the river about 10 miles downstream from Kennewick. The nearest grain loading terminal is at Port Kelley, 4 miles below Attalia. These terminals are privately owned and operated, and not open to general public use. The nearest available public terminal is located at The Dalles, Oreg., 139 miles by river from Kennewick.

IMPROVEMENT DESIRED

23. The views and desires of local interests, represented by the port of Kennewick, relative to river terminal needs at Kennewick, were presented at a public hearing held in Kennewick on March 14, 1940. It was requested at the hearing that a navigation channel in the Columbia River be provided, extending from the mouth of Snake River to Kennewick, and that a turning basin be provided at Kennewick, adequate for access to the proposed river terminals at that point, and for turning or otherwise maneuvering river craft that might use the terminals. It was stated that the depth and width of channels desired should be commensurate with the needs of prospective river commerce, but should not be less than dimensions authorized for Columbia River below the mouth of the Snake.

24. Plans of the port of Kennewick for the development of river terminals at Kennewick and savings expected by the use of the terminals were presented at the hearing. It was explained that Kennewick was the natural point of interchange between land and water for commodities produced or used in the tributary area, and that provision of terminal facilities at that point was necessary for full utilization of the navigable channel of Columbia River and realization of benefits from such use. The financial resources of the port of Kennewick were stated as inadequate for any expenditure in river dredging, after providing terminal facilities. Terminals to be provided by the port would be open to the public on equal terms, would provide large savings to the public of such nature that reasonable expenditures by the Federal Government to provide access to the terminals would be justified. The port promised to provide free of cost to the United States disposal areas for disposal of excavated material, if required.

25. Representative bodies of the city of Pasco participated in the hearing. Economic benefits presented by the port of Kennewick covered interchange at Pasco, as justification for part of the costs of channel work. Pasco officials, however, expressed their intention to organize a port body, and to construct a terminal in Columbia River opposite the site of the proposed Kennewick terminal. They joined with the port of Kennewick in requesting that the Federal Government undertake the necessary channel excavation in Columbia River to provide free access to the proposed terminals. The proposed terminal at Pasco would consist of a warehouse and dock for transfer of miscellaneous commodities only, and would not be equipped for bulk wheat and gasoline. The comprehensive plan of the port of Pasco includes a grain terminal on Columbia River about 25 miles upstream from Pasco; and two grain terminals on Snake River, 19 and 26 miles above the mouth of the river.

26. At the hearing the area tributary to a port at Kennewick was limited to a portion of Benton County, the southern part of the county being considered tributary to the Columbia River at points some distance below Kennewick. Tonnages of commodities expected by local interests to transfer at Kennewick, if adequate transfer facilities were provided, and estimated savings, are shown below. Tonnages are based on present production quantities, and savings estimated by comparing the tariff rates charged by existing land-transportation agencies with prospective rates for water transportation.

Benton County

Commodity	Tons	Savings
Grain	10,000	$8,000
Hay	20,000	17,000
Wool	400	1,100
Potatoes	2,000	750
Canned goods	2,500	3,625
Total	34,900	30,475

Savings per ton, 87 cents.

COMMERCE

27. *Former water commerce.*—Beginning about 1903, steamboats and barges operated on Columbia River in the Kennewick area, handling traffic between Priest Rapids, 75 miles upstream from Kennewick, and Portland, with stops at many intermediate points. Commodities handled included lumber, cement, and all types of building materials, machinery, and hardware upstream, and wheat downstream. The operations continued for several years, but were finally discontinued mainly on account of navigation difficulties encountered during the low-water season. Several boats were lost, rendering operation costs so high that competition with railroad rates became uneconomic.

28. *Present water commerce.*—No use is now being made of the river channel near Kennewick for navigation purposes except by pleasure craft. On account of the swift currents, use by pleasure craft is impracticable except at moderate water stages. With the completion of a satisfactory channel between down-river markets and Kennewick, and the provision of adequate terminal facilities at that point, it is believed river-transportation companies would extend their routes to the port, and that commodities would enter and leave the port in considerable quantities.

29. Traffic through The Dalles-Celilo Canal is indicative of the trend of upper Columbia River traffic. Tonnages for 1939 and 1940 are—

Statement of tonnages through Dalles-Celilo Canal, in tons

Period	Petroleum products	Food products	All other traffic	Total
1939				
January	2,738	1,369	90	4,197
February	3,137	3,296	1	6,434
March	2,981	2,265	300	5,546
April	7,299	1,435	0	8,734
May	7,980	1,210	2	9,192
June	11,858	708	162	12,728
July	16,494	1,325	6	17,825
August	16,064	3,392	38	19,494
September	14,973	2,704	0	17,677
October	8,211	0	0	8,211
November	15,294	769	0	16,063
December	12,984	450	0	13,434
Total	120,013	18,923	599	139,535
1940				
January	20,050	694	0	20,744
February	17,177	968	122	18,267
March	25,678	2,425	0	28,103
April	25,135	2,433	12	27,580
May	29,305	3,433	280	33,018
June	31,962	2,337	130	34,429
July	35,330	4,969	60	40,359
August	33,343	4,950	22	38,315
September	29,467	2,605	204	32,276

30. Food products in the tabulation are largely wheat, moving downstream. The preponderance of the petroleum movement over wheat is due in part to the lack of transportation facilities for the latter. While the wheat movement is primarily dependent upon market demands, it is felt the present traffic would be considerably larger provided there were more grain barges on the river to handle increased traffic. Navigation companies have concentrated on provision of facilities for handling petroleum products upstream, but have not yet entered extensively into the downstream wheat movement. When the movement of petroleum has reached the saturation point, it is believed the traffic in grain and other commodities downstream will experience a major increase. In addition, upon completion of the ship channel to The Dalles, the movement of oil tankers to that port will begin, permitting the presently operated light-draft craft to concentrate on the upper river, with a greater tendency to further the movement of wheat.

31. *Production.*—The principal commodities produced in the tributary area, which could move by water from Kennewick if transportation savings could be shown, include wheat, hay, wool, and processed fruits and vegetables. Quantities of commodities produced, tabulated below, are based on reports of the Bureau of the Census and the Agricultural Adjustment Administration, augmented in some cases by a personal canvass of producers. The figures do not show the highest yields, but indicate the average production expected over a future period under existing conditions.

Average annual production, tributary area, selected commodities, tons

	Benton County	Yakima County	Total
Wheat	25,000	----------	25,000
Alfalfa	35,000	42,000	77,000
Wool	500	600	1,100
Processed products	3,000	4,000	7,000

32. *Present incoming commodities.*—The principal commodities shipped into the tributary area include gasoline, and building materials, groceries, machinery, and material used in the processing industry, classed below as miscellaneous. Quantities of such shipments given below were obtained from records of the Department of Commerce, Bureau of Mines, United States Forest Service, Oregon State Planning Board, and reports of distributors in the area.

Shipments into tributary area, tons, annual

	Benton County	Yakima County	Total
Gasoline	7,000	9,000	16,000
Miscellaneous	9,000	10,500	19,500
Total	16,000	19,500	35,500

33. *Rate structure, rail.*—The present rail rates on representative incoming and outgoing commodities between the tributary area and shipping points are—

	Kennewick		Prosser	
	Per ton	Per ton-mile	Per ton	Per ton-mile
		Mills		*Mills*
Wheat to Puget Sound	$3.60	14.4	$3.60	16.9
Wheat to Portland	3.60	15.9	3.80	14.5
Gasoline from Portland	3.70	16.4	4.10	15.6
Sugar from Portland	4.60	20.3		
Chemicals from Portland	5.00	22.1	6.40	24.3
Iron and steel from Portland	4.20	18.6		
Canned goods to Portland	5.60	24.7		

34. *Rate structure—truck.*—Present published truck rates on gasoline to the tributary area and vicinity are as shown below:

	Per ton	Miles	Mills per ton-mile
Umatilla to Pasco	$1.80	44	41
Attalia to Pasco	1.10	15	73
Umatilla to Prosser	2.20	79	28
Attalia to Prosser	1.90	50	38
Pasco to Prosser	1.70	35	48.5
Portland to Umatilla	5.00	190	26
Portland to Wallula	5.60	217	26
Portland to Pasco	5.60	232	24

35. *Rate structure—water.*—There is no uniform established water rate between Portland and upstream points on Columbia River. The water rate on wheat from Port Kelley to Portland, 222 miles, is $1 per ton or about 4.5 mills per ton-mile. Truck haul to the port costs an additional $1 per ton for an average 45-mile haul. The unloading charge at Port Kelley is 30 cents per ton with insurance costs additional. The present water rate on gasoline, Portland to Umatilla (197 miles), is $1.50 per ton or 7.6 mills per ton-mile. The rate to Attalia (226 miles) is $1.90 per ton or 8.4 mills per ton-mile. The latter rate includes unloading at Attalia, storage, through-put, and evaporation. The rate for this haul 8 months ago was $2.70.

36. Studies that have been made by the North Pacific Division for the movement of bulk wheat and petroleum between Portland and Attalia indicate possibilities of barge transportation at costs as low as 6 mills per ton-mile. This cost is predicated on an adequate channel and steady movement of tow boats of 1,200 horsepower with a maximum load of two barges having a loaded draft of 6.5 feet and a pay load of 655 tons each. Approximately 10 percent of the traffic would be in wheat moving downstream. In the absence of existing water rates to and from Kennewick, it is estimated that a rate of 6 mills per ton-mile for wheat, and 8 mills per ton-mile for petroleum would be a fair rate for the purposes of this report, and that, in the case of miscellaneous package commodities, an additional $1 per ton would be sufficient to cover the greater cost of stowage space and transfer.

37. *Potential water commerce.*—It is probable that only a part of the tonnage now leaving or entering the tributary area would move by water to or from Kennewick, even though a saving could be shown by the use of water transportation. Present trade connections and established transportation agreements, difficult of evaluation, might

present sufficient advantages to the shipper to counteract possible reduction in rates. Interruptions to water traffic by high-water stages and ice conditions would also tend to prevent use of the river by some shippers. A large part of the wheat produced in the area now is shipped to Pacific coast markets. Wheat, outgoing, and gasoline, incoming, are moving by water on the upper Columbia, gasoline in large, and wheat in smaller quantities. Gasoline entering the area is transferred from the river at Attalia, with no wheat at present shipped by water from the tributary area. If adequate terminal facilities are provided at Kennewick it is believed that about one-half the wheat produced annually in the area, or 15,000 tons, would come to that port for transfer to barges, and that all of the gasoline, 16,000 tons per year, would be unloaded at the port for distribution. While it is possible that miscellaneous outgoing and incoming commodities would move by water if the Kennewick terminal is constructed, it is not probable that this movement would be of significance for some years, pending the arousing of interest in such a movement and the establishment of suitable carriers on the river. Savings in transportation costs by the use of the river, for this study, are based solely on shipments of wheat and gasoline.

SAVINGS

38. *General.*—Transportation savings by use of the river are obtained by comparison of the lowest present transportation costs and costs by the most favorable combined land and water movement. In this comparison consideration is given terminal and handling charges not common to all transportation methods. Published rail rates are generally available for the study. Based on known rates, it is considered that a fair truck rate would be 30 mills per ton-mile, with extension rate of 16.5 mills, for grain and petroleum. Water rate is considered to be 6 mills per ton-mile on wheat and 8 mills on gasoline.

39. *Wheat.*—A portion of the wheat shipped from the area would normally be brought by truck to Kennewick for shipment by rail. The remainder would be loaded at other stations on the railroad, centering at Prosser, 33 miles from Kennewick. For transfer to water at Kennewick, an extension truck haul averaging 33 miles would be necessary for the latter portion. Resulting tonnage costs from the Prosser zone would be $3.60 per ton by rail to Puget Sound (the rate to Portland is $3.80 per ton), to be compared with a combined truck (33 by 16.5 mills) and water (236 by 6 mills) rate to Portland of $1.96. The rail rate from the Kennewick zone is $3.60 to either Puget Sound points or Portland, and the water rate to Portland, at 6 mills per ton-mile, $1.42. At present wheat brought to the river at Port Kelley and Umatilla is transferred from interior warehouses which necessitates an extra terminal and handling charge over the present rail movement. This charge amounts to between 80 and 90 cents per ton. For the movement to water through Kennewick, it is planned to provide storage elevators at the port adequate to handle about one-third of the expected wheat tonnage requiring storage, the remaining two-thirds to be held in farm storage until sold. Studies of the costs of farm storage indicate that costs will be far below present costs at interior warehouses. It is estimated that farm stor-

age costs, not included in the rail rate, when spread over the entire wheat tonnage would be not more than 25 cents per ton. For comparison with the rail rate this latter amount should be added to the water rate of $1.42, providing a total of $1.67 per ton from Kennewick to Portland.

40. *Gasoline.*—This commodity is at present transferred from barges at Attalia and brought to the tributary area by truck. The saving on a water movement to Kennewick, with distribution from that point, would be obtained by a comparison of the costs of truck and water haul from Attalia to Kennewick, a river distance of 10 miles and by highway, 17 miles. The water movement would cost 8 cents (10 by 8 mills), and the truck movement, 51 cents (17 by 30 mills) per ton. Terminal and handling charges and truck haul are common to both movements.

41. *Summary of savings.*—The total savings on the estimated commodity movement that would result from the construction of terminal facilities and a turning basin in Columbia River near Kennewick would be as shown below. The water rate for wheat includes the interior warehouse charge of 25 cents per ton, and extension truck haul of 54 cents per ton from Prosser.

Commodity	Tons	Truck or rail rate	Water rate	Savings	
				Unit	Total
Wheat, Kennewick to Portland	7,000	$3.60	$1.67	$1.93	$13,510
Wheat, Prosser to Portland	8,000	3.60	2.21	1.39	11,120
Gasoline, Portland to Kennewick	16,000	.51	.08	.43	6,880
Total	31,000			1.00	31,510

SURVEY

42. The field survey conducted for this report consisted of soundings in Columbia River between the mouth of the Snake River and Kennewick, with probings in the excavation area of the proposed turning basin. Field reconnaissances were made for securing data as to present transportation rates, and present and proposed shipments from and to the tributary area.

PLANS OF IMPROVEMENT

43. Plans of the port of Kennewick as presented by the consulting engineer for the port include: Repair of three existing warehouses located on the terminal property, to be used as transit sheds; construction of a 50,000 bushel wheat elevator and dock; gasoline tanks with capacity of 500,000 gallons; equipment for transferring commodities at the port, such as a conveyor belt, a derrick, and pipe lines. The total investment is estimated by local interests at about $40,000. The dredging requested of the Federal Government is confined to the area in front of the port property, and would consist of the excavation of about 70,000 cubic yards of sand and gravel, estimated to cost $30,000, with annual maintenance of $1,000. The depth proposed for the dredged area would be 6 feet at low water, the eventual proposed controlling depth for the Columbia River channel below Kennewick.

The river channel between Kennewick and the mouth of the Snake River is adequate for all navigation expected. No additional aids to navigation will be required.

ECONOMIC ANALYSIS

44. The proposed plans of improvement are based on a Federal investment of $30,000 for dredging, and investment by private interests for terminal facilities. It is believed the estimated cost of $40,000 prepared by local interests should be raised to $50,000 to provide for miscellaneous equipment and contingencies not contained in the lower estimate. Estimated annual costs are as shown below.

(a) Federal investment: Excavation		$30,000
(b) Federal annual charges:		
Interest at 3.0 percent	$900	
Amortization, 50-year life, 0.89 percent	267	
Maintenance	1,000	
Total		2,167
(c) Non-Federal investment:		
Terminal facilities	$50,000	
Real estate	5,000	
Total		55,000
(d) Non-Federal annual costs:		
Interest at 4 percent	$2,200	
Amortization, 25-year life, 2.4 percent of $50,000	1,200	
Maintenance, repairs, and replacements	2,500	
Total		5,900
(e) Total annual costs		8,067
(f) Total annual benefits		31,510

NAVIGATION DIFFICULTIES

45. Navigation of the river channel to Kennewick, with transfer of commodities at that point, would in general present no obstacles providing the proposed turning basin were constructed. Craft of the type now operating in the Columbia River below the mouth of the Snake could operate successfully to and from Kennewick, with reduced loads at low water stages due to the limited depth (5 feet at low water) in Homly Rapids, to be available on completion of present plans of improvement. There would be some interference with navigation from high winds, extreme water stages, and ice conditions, but probably not for protracted periods.

DISCUSSION

46. While there is a port organization at Kennewick, Wash., on Columbia River, there is at present no river traffic to and from the port. Terminal facilities are inadequate and construction of such facilities will be necessary to attract navigation companies to the port. Although a terminal for transfer of package goods is contemplated at Pasco, this terminal would not enter into competition with a terminal at Kennewick, as major items to be transferred at Kennewick, bulk wheat and gasoline, could not be handled at the Pasco terminal. Transfer of miscellaneous commodities does not enter into the economics of this study.

47. The port of Kennewick proposes to build a terminal on the river with facilities for handling bulk wheat and gasoline, and miscellaneous package commodities. The site selected for the terminal is the best site in the area, but dredging is required to provide easy access to the terminal at all water stages. Port officials contend that, by reason of the general nature of the benefits that are expected to accompany use of the port, the dredging should be accomplished by the use of Federal funds.

48. At the hearing held in Kennewick for purposes of this report evidence was presented relative to traffic expected to be attracted to the port, with provision of adequate terminal facilities, and savings to the general public were estimated. These data have been reviewed and extended for this report. At the hearing, the area for which benefits from the use of the river were expected was limited to a portion of Benton County. Subsequent study shows that the portion of Yakima County immediately west of Benton County also lies within economic reach of the river at Kennewick, and traffic is shown herein for that additional area.

49. Assumptions in this report as to expected river traffic are based on a study of present rates and river movement. The most important commodities expected to be moved by water are wheat, outgoing, and gasoline, incoming. These commodities move far inland on the Columbia below the mouth of the Snake, and it is expected that the movement would be extended to Kennewick if proper terminal facilities were provided at that point. Savings computed for these commodities are comparatively large, but are believed justified by a comparison of existing rates. The movement of miscellaneous package goods to the port will consist primarily of small shipments, and convenience and time of delivery will in many cases outweigh the estimated savings on such shipments. While it is believed reasonable to assume that some miscellaneous commodities would be attracted to the water movement if proper handling facilities were provided at the port, such movement would probably be deferred for some years, and is not given economic consideration in this study. Savings are based on movements of wheat and gasoline, and are estimated annually at $31,510 for a 31,000-ton annual movement.

50. The port of Kennewick proposes to construct the necessary terminal facilities, estimated to cost $55,000, including $5,000 for necessary real estate, but ask that the Federal Government perform the required dredging in Columbia River, estimated to cost $30,000. The annual cost of the entire $85,000 improvement is estimated at $8,067. The ratio of benefits to costs would be about 4 to 1, providing ample economic justification for construction of the proposed works. The contention of local interests that the dredging be done with Government funds appears to be reasonable.

51. The existing project on Columbia River has as its upstream limit the mouth of the Snake River, about 4 miles below Kennewick. Consideration of the expenditure of Federal funds at Kennewick render it advisable to include in the existing project the stretch of Columbia River from the mouth of the Snake River to and including the highway bridge across the Columbia at Kennewick. Modification of the existing project would be necessary.

CONCLUSIONS

52. Savings estimated by the use of the proposed river terminal facilities at Kennewick are based on studies of present production and shipments to and from the tributary area, and studies of present transportation movements and rates. The estimate of tonnage and savings is believed conservative, and expected benefits outweigh anticipated costs. Construction of shore facilities is believed a function of local interests, but it is held fitting that the necessary dredging in the Columbia River be done with Federal funds.

RECOMMENDATIONS

53. The district engineer recommends that the project "Columbia River and tributaries above Celilo Falls to the Mouth of Snake River, Oregon and Washington," be modified to include (*a*) extension upstream from the mouth of Snake River to and including the highway bridge at Kennewick, and (*b*) provision of a turning basin at Kennewick, having a 6-foot depth at low water, at an initial cost to the Federal Government of $30,000 for dredging; provided that no work be done or funds be expended on the project until assurances satisfactory to the Secretary of War have been given by local interests that adequate shore terminal facilities will be constructed at Kennewick to insure full use of the river channel.

C. R. MOORE,
Lieutenant Colonel, Corps of Engineers,
District Engineer.

[First endorsement]

OFFICE, DIVISION ENGINEER, NORTH PACIFIC DIVISION,
PORTLAND, OREG., *January 25, 1941.*

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. I concur in the report and recommendation of the district engineer.

R. PARK,
Colonel, Corps of Engineers,
Division Engineer.

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